

### **REMARKS / ARGUMENTS**

Reconsideration of the present application is respectfully requested.

Claims 1 to 33 were and are currently pending in this application.

In regard to the rejection of claims 1 to 33 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication No. US 2002/0086811 to Bronfin *et al.* in view of U.S. Patent No. 6,845,809 to Norville *et al.*, Applicant respectfully submits that this grounds for rejection is in error and should be withdrawn. Nothing in Bronfin *et al.*, alone or in combination with Norville *et al.*, teaches or even remotely suggests the magnesium-based, semi-solid casting alloy of claims 1 to 16 and 33, or the magnesium-based casting of claims 17 to 32.

Bronfin *et al.* disclose a magnesium-based alloy containing, in weight percent, at least 86% magnesium (Mg), 4.8 to 9.2% aluminum (Al), 0.08 to 0.38% manganese (Mn), 0.00 to 0.9% zinc (Zn), 0.2 to 1.2% calcium (Ca), 0.05 to 1.4% strontium (Sr), and 0.00 to 0.8% rare earth elements.

It is respectfully submitted that the alloy disclosed in Bronfin *et al.* necessarily contains calcium (see Bronfin, paragraph [0022] for example), which seems to be an important element of the alloy. Indeed, the examples disclose an alloy with at least 0.2 weight % calcium and it is specified in paragraph [0010] that the sum of calcium and strontium contents is higher than 0.9 weight % and lower than 1.6 weight %.

It is respectfully submitted that under the general industry guidelines for manufacture of an alloy, specifically ASTM B-93, impurities are generally limited to 0.1% maximum for the alloy to be considered within specifications. A calcium level greater than

that, or of 0.2%-1% should only be present if the element is added. Adding of any element above 0.1% would therefore be considered alloying to a person of skill in the art and would not be considered an impurity. In view of the percentages taught by Bronfin *et al.*, it is respectfully submitted that calcium cannot be considered as an impurity in the alloy disclosed in this document.

By contrast to the teachings by Bronfin *et al.*, the present application discloses and claims a magnesium-based, semi-solid casting alloy "comprising, in weight percent, from about 3 to 7% aluminum, from about 0.5 to 3% strontium, with the balance being magnesium, except for impurities commonly found in magnesium alloys".

Applicant respectfully submits that calcium is not considered by persons of skill in the art as an *impurity commonly found in a magnesium alloy*. Indeed, as can be seen from U.S. Patent No. 6,342,180 (granted to Lefebvre *et al.* on January 29, 2002), the main commonly found impurities in magnesium alloys appear to be iron (Fe), copper (Cu), nickel (Ni) and silicon (Si). In addition, it is apparent from this same patent that calcium was voluntarily added to the end magnesium alloy so that it reaches a proportion ranging between 0.1 and 0.5% by weight (see abstract of Lefebvre *et al.* for example). From the point of view of a person of skill in the art, calcium is therefore clearly not classified as an impurity commonly found in a magnesium alloy.

In view of the above, Applicant respectfully submits that the subject matter of independent claims 1, 7, 17 and 23, more specifically the composition of the claimed alloys, clearly differs from the alloys disclosed in Bronfin *et al.* Besides, Table 1 of the present application (page 2, paragraph [0025]) discloses the chemical composition of a tested magnesium alloy, which does not include calcium.

In addition, Applicant respectfully notes that although the magnesium alloys disclosed in Bronfin *et al.* may be used in semi-solid casting processes, the Examiner has acknowledged the fact that Bronfin *et al.* does not disclose or suggest any solid fraction percentage of their alloy.

Furthermore, Applicant respectfully reiterates that there is in Bronfin *et al.* no indication of a possible criticality of the solid fraction percentage in an alloy for improving its castability (which is the object of Bronfin's invention), and therefore no incentive for a person skilled in the art of magnesium alloys to search for further information in that direction. Thus Applicant respectfully submits that Bronfin *et al.* provides no motivation for the person of skill in the art to combine the teachings of Bronfin *et al.* with those of Norville *et al.*

Should a person of skill in the art nevertheless combine the teachings of both cited references, Applicant respectfully submits that he or she would not have been led to the magnesium-based, semi-solid casting alloy disclosed and claimed in the present application, and further submits the following arguments in this regard.

Only result effective variables can be optimised and therefore a particular parameter must first be recognised as a result effective variable, that is a variable which achieves a recognised result, before the determination of the optimum or workable ranges might be characterised by routine experimentation, MPEP 2144.05 B.

Norville *et al.* clearly teaches at Col. 19, lines 27-30, varying the solid fraction, and thus the viscosity, in order to optimise flow of the resultant slurry into the mold or die:

"The style of part to be produced and the number of mold or die cavities influence the predetermined solid fraction percentage which determines the alloy viscosity. ..."

It is clearly apparent that on reading Norville *et al.*, solid fraction can at most be considered a result effective variable for viscosity and optimum flow of the resultant slurry into the mold, but for no other purposes. Indeed, Norville *et al.* does not teach varying the solid fraction in order to improve other properties of the semi-solid cast samples, such as Ultimate Tensile Strength, Elongation or Yield Strength, and therefore would not suggest experiments for this purpose. All that Norville *et al.* teaches is varying solid fraction to change viscosity and therefore it is respectfully submitted that it is not recognizable from the teachings by Norville *et al.* that other performance parameters such as Ultimate Tensile Strength, Elongation or Yield Strength are functions of the solid fraction percentage. Recognition of such functionality would be essential to the obviousness of conducting experiments to determine a value of the solid fraction percentage which will substantially improve other performance parameters other than viscosity such as Ultimate Tensile Strength, Elongation or Yield Strength of the semi-solid cast. *In re Antonie*, 559 F.2d at 620, 195 USPQ at 6. Obvious to try is not the standard of 35 USC 103. *In re Tomlinson*, 53 CCPA 1421, 363 F.2d 928, 150 USPQ 623 (1966).

In addition, it is respectfully submitted that from the point of view of a person of skill in the art, the impact of the solid fraction percentage on physical properties of the semi-solid cast (such as Ultimate Tensile Strength, Elongation or Yield Strength for example) would not “*naturally flow*” from a mere relationship between solid fraction and viscosity in the context of the style of part to be produced and the number of mold or die cavities, as taught by Norville, *et al.* Indeed, Norville *et al.* does not teach that viscosity is determinant of these other physical properties of an alloy. Therefore it is respectfully submitted that the Examiner’s citation of *In re Obiaya* does not apply to the present set of facts.

For the reasons above, Applicant respectfully submits that the solid fraction percentage is not a result effective variable in the context of the present invention.

In addition, Applicant respectfully submits that the only numerical values of solid fraction percentages mentioned and discussed in Norville *et al.* are above 40% (on column 3, line 42) and even reach 70 to 80% (0.7 to 0.8, considered to be the definition of a *high solid fraction* in column 4 line 26). A high solid fraction is said to impart mechanical strength of the final product of a semi-solid process on column 4, lines 26-28, and column 7, lines 63-66. "Because of its *high solid fraction*, semi-solid metal has small shrinkage when it solidifies in the die", can also be read in the description of the preferred embodiment of Norville *et al.*, on column 7, lines 61-63. It is therefore respectfully submitted that, should a person of skill in the art consider Norville *et al.* to obtain further information on semi-solid casting, he or she would find no incentive in such reference to lower solid fraction down to 20% or less. Norville *et al.* generally teaches away from using low solid fractions.

In light of the above arguments, it is respectfully submitted that, should a person skilled in the art have combined the teachings of Bronfin *et al.* with those of Norville *et al.*, he or she would not have been led to the magnesium-based, semi-solid casting alloy disclosed and claimed in the present application. In particular, it is respectfully submitted that claims 1-4, 7-10, 17-20 and 23-26 are novel and inventive over Bronfin *et al.* in view of Norville *et al.*

Moreover, since the alloy claimed is novel and non-obvious in view of the cited references, it is respectfully submitted that its claimed properties (claims 5-6, 11-12, 21-22 and 27-28) and microstructure (claims 15-16 and 31-32) are not inherently anticipated or rendered obvious by Bronfin *et al.* It is also respectfully submitted that no Al<sub>4</sub>Sr intermetallic (as claimed in claims 15 and 16 of the present application) is disclosed or suggested in Bronfin *et al.* or Norville *et al.*

Furthermore, it is respectfully submitted that in view of the inventiveness of the composition of the magnesium-based alloys of the present invention, dependent claims

13, 14, 29 and 30, directed to the fact they are to be used in a thixotropic casting process, are also novel and inventive over Bronfin *et al.* and Norville *et al.*

In specific regard to claim 33, and as noted above, the Examiner has rejected this claim under 35 U.S.C. 103(a) as being unpatentable over Bronfin *et al.* in view of Norville *et al.*, considering that the presence of  $Al_4Sr$  could be presumed to be inherent in the prior art alloys.

In addition to the above arguments regarding claim 1, which equally apply to dependent claim 33, Applicant respectfully traverses the Examiner's rejection as follows.

Applicant respectfully notes that although the composition of the alloys, and more particularly the list of the intermetallic phases in Table 2 (Fig 2), is rather specific and detailed in Bronfin *et al.*, nothing in this document indicates that the alloy might contain an  $Al_4Sr$  intermetallic. Therefore, the Bronfin alloys might comprise  $Al_4Sr$ , although it is strongly unlikely, but also may not comprise any  $Al_4Sr$  intermetallic (as this is the case for Examples 1-14 of Bronfin). Thus it cannot be said that the presence of  $Al_4Sr$  will inherently result (*i.e.*, always result) from the preparation of an alloy according to the teachings by Bronfin *et al.* Inherency may not be established by probabilities. *Ex Parte Malathy Nair, James W. Geoffrion, and Mark A. Kooyman*, Appeal No. 2001-0901, citing *In re Oelrich*, 666 F.2d 578, 581, 212 USPQ 323, 326 (CCPA 1981).

It is therefore respectfully submitted that claim 33 is new and inventive over the cited references.

Pierre Labelle *et al.*  
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From the foregoing, further and favorable action in the form of a Notice of Allowance is believed to be next in order, and such an action is earnestly solicited.

Respectfully submitted,



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